

Saving electrical energy in schools

– good housekeeping for lighting, IT and other curriculum-based equipment



- No-cost good housekeeping practices to reduce energy costs
- Lowering carbon dioxide emissions through the energy-efficient use of electrical equipment

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1 INTRODUCTION

Make a commitment to energy efficiency.

*Staff and pupils will
undertake good
housekeeping only if it
is actively supported by
head teachers.*

The total consumption of electricity by UK primary and secondary schools in 1994 was around 7 PJ (2000 million kWh), equivalent to the total annual domestic electricity supply for Hertfordshire, and costing around £115 million.

Electricity is more expensive to purchase than fossil fuels. In a recent survey^[1] of over 2000 schools, although electricity accounted for only 18% of energy consumption it represented just over 60% of total energy costs.

Furthermore, compared to gas, using energy from electricity contributes around two-and-a-half times the amount of carbon dioxide (CO₂) to the atmosphere during its generation by power stations. CO₂ emissions contribute to climate change by enhancing the atmospheric 'greenhouse effect' and causing gradual global warming.

Although lighting accounts for most electricity consumption in schools, with increasing use of personal computers (PCs) and other information technology (IT) equipment, overall electricity consumption levels (and CO₂ emissions) are rising. Therefore, reducing your school's electricity consumption not only makes economic sense but will also help achieve the UK government's target to reduce CO₂ emissions as part of the Climate Change programme. Furthermore, under local management of schools (LMS), energy cost savings can be used for further investment in energy-saving measures, or to contribute towards the school's curriculum.

ABOUT THIS GUIDE

This Guide provides information and guidance on how to reduce the power consumed by lighting, IT equipment and other curriculum-based electrical equipment by adopting good housekeeping and energy management practices.

Good housekeeping tips are given for lighting, with advice and suggestions on how to reduce glare. Information is also included on the most energy-efficient types of lighting to consider when replacing lamps and lighting installations.

The Guide includes typical levels of energy consumption by specific types of electrical equipment found in schools, together with the likely energy savings that can be achieved by implementing the suggested measures.

The information and advice should prove helpful when purchasing new electrical equipment and systems. The energy efficiency options are designed not only to influence the operating of equipment but also to be reflected in a school's procurement policy.

This Guide is written for headteachers, governors, teachers, premises managers and other school staff. The school may wish to involve an external contractor or seek specialist advice from the local education authority when contemplating modifications to lighting systems or purchasing electrical equipment.

A good housekeeping energy checklist is included on page 16 and references and suggested further reading are shown on page 18.

This Guide does not include school catering or building services equipment. Good housekeeping for catering equipment is covered in Good Practice Guide 222^[2] 'Reducing catering costs through energy efficiency – a guide for kitchen designers, contract caterers and operators'. Advice on building services can be found in Good Practice Guide 145 'Maintaining the efficient operation of heating and hot water systems in schools (GPG 145)^[3]'.

INTRODUCTION

GOOD HOUSEKEEPING

Electricity savings of at least 10% can be achieved by adopting good housekeeping practices. The savings can be achieved in a school with its existing equipment and buildings and without any additional financial investment.

Good housekeeping:

- requires no capital investment
- can be put into operation immediately
- takes very little time
- gives cost, energy and environmental benefits that start immediately.

Good housekeeping involves switching off lights and equipment when not required and using the energy-saving features of electrical equipment. It is as much to do with attitude as anything else. Good housekeeping is not a 'do it and forget it' exercise. The long-term objective in motivating staff and pupils must be to change attitudes and energy-using habits gradually so that the prudent use of resources becomes an instinctive part of everyday behaviour.

This Guide will help identify good housekeeping measures for reducing electricity consumption. However, getting staff to change habits and pupils to follow good advice requires a demonstrable commitment to energy efficiency, perhaps by starting with an energy awareness campaign^[4]. For advice on getting started refer to Good Practice Case Studies and Guides, produced as part of the Department of the Environment, Transport and the Regions' (DETR's) Energy Efficiency Best Practice programme. These are listed on page 19 and are available free of charge from BRECSU Enquiries Bureau (details on back cover).

There may also be opportunities for incorporating energy efficiency within the school curriculum. This would give pupils the chance to get involved, where appropriate, perhaps by calculating reductions in electricity consumption achieved through good housekeeping. Similarly, it is worth publicising how much the savings are benefiting the school and the environment. For further assistance contact the organisations referred to on page 18.

ELECTRICITY CONSUMPTION

In simple terms, the more lighting and electrical equipment that is connected to the electricity mains the higher the potential electricity consumption. Energy costs can be substantially reduced by manually switching off lights and equipment when not required or by using in-built energy-saving features. For example, research has indicated that energy use during computer operational time can be reduced by 60% or more with the use of appropriate energy-saving settings.

Energy-efficient lighting consumes less power than less efficient alternatives, although this should not be used as an excuse to leave lighting switched on throughout the day. Other electrical equipment may require in-built energy-saving features to be activated before the benefits can be derived.

The actual total energy consumed by most equipment also depends on:

- the number of staff and pupils using the equipment
- how long they use the equipment
- how the equipment is operated.

Over the past five years some items of electrical equipment, such as computers and printers, that reduce consumption to under 30 watts in a 'sleep' mode, have been given an Energy Star label. Energy Star rated equipment can be restarted with little effort or delay and maintains any network connections, but it must be explicitly activated before it will operate. A large proportion of IT and reprographic equipment currently for sale in the UK meets the energy-saving requirements of the Energy Star label.

**Switch off lighting
in teaching areas at
the end of each
occupancy period.**

*Leaving lights on even in
a small teaching area
can cost more than £200
per year.*

2 LIGHTING

It is not true that fluorescent lights use more energy if they are switched on and off frequently. If a room is going to be unoccupied for more than five minutes, switch off the lights!

Lighting accounts for the highest proportion of all energy costs in schools (around 28%), yet it offers the greatest potential for saving energy by applying good housekeeping measures.

Within the school environment lighting should satisfy three criteria:

- appropriate illuminance
- visual comfort
- energy efficiency.

ILLUMINANCE

Illuminance may be defined simply as the 'light level provided on a surface by either daylight or electric light'. Lighting requirements are covered by the School Premises Regulations, outlined in the Department for Education and Employment's (DfEE's) publication 'Guidelines to environmental design in schools'^[5]. The Regulations state that each room or other space in a school building shall have lighting appropriate to its normal use; and the maintained illuminance of teaching accommodation shall be not less than 300 lux on the working plane. In teaching accommodation where visually demanding tasks are carried out provision shall be made for a maintained illuminance of not less than 500 lux on the working plane.

Although light meters are easily obtainable and simple to use, it is recommended that school staff consult

with the education authority or county architect's department if concerned about lighting levels.

DAYLIGHT

Staff and pupils in classrooms and staff rooms should always take advantage of available daylight. Throughout much of the year, the levels of daylight should be sufficient for electric lighting to be switched off in parts of the school. Clearly, the window orientation and depth of the school building are factors to consider, but by adopting the simple practice of using daylight rather than switching on lights, significant electrical consumption can be saved.

It is an unfortunate fact that, where lights are switched on first thing in the morning, they tend to be left on for the rest of the day. The good housekeeping practice of switching lights off in classrooms at the end of each lesson, particularly in spring and summer, leaves the decision as to whether or not daylight levels are adequate to be taken by the next class.

ELECTRIC LIGHTING

Electric lighting serves two distinct purposes during daylight hours:

- to enhance the general brightness of the classroom
- to increase illuminance on visual tasks.

LIGHTING

Energy savings of around 3% can result if someone is made responsible for switching off lights at break and lunchtimes and at the end of the school day. This can be done by the teacher or caretaker, or by pupils acting as 'energy monitors'.

Use of automatic lighting controls, such as time switches and daylight sensors, can result in a further saving of around 5% of the school's energy bill – with the proviso that the lights can be switched on manually if required. Where these controls are not installed, simple good housekeeping procedures can lead to energy savings, but their effectiveness depends on the diligence of the users.

VISUAL COMFORT

Where a school is considering changing its lighting system, proper attention should be given to:

- illuminance
- the direction of the lighting
- the avoidance of glare
- safety.

Proper design to maintain recommended lighting levels within the classroom and other areas is clearly important to ensure good visibility, safety and security. Good lighting can also help to create an appropriate environment in which pupils can learn.

A common problem in the classroom is glare. This occurs when a bright image seen either directly or by reflected light interferes with the normal process of vision, possibly causing difficulty in undertaking visual tasks. Although pupils will try to compensate for glare by turning their heads or squinting, glare is a cause of eyestrain and headaches and can sometimes be disabling.

At best, glare can cause loss of concentration and reduce productivity. Therefore, glare should be minimised by addressing the causes.

Most working surfaces are partly glossy, so special care must be taken with the positioning of classroom furniture in relation to light sources, including luminaires, roof lights and side windows, to avoid seeing reflected images of bright sources. Direct and reflected glare can be minimised by correct positioning of desks, and blinds can reduce glare caused by excessive daylight.

Glare is a particular problem for pupils using computers, where unwanted reflections of bright sources occur in the computer screens and can be bright enough to make reading of screen characters difficult. Louvres on fluorescent lighting will help reduce the incidence of glare. With the high brightness levels of Windows™-based programs, it may be simpler to tilt the computer screens to avoid direct and reflected light from lamps (figure 1). If the school's budget permits, anti-glare filters can be purchased to fit on to monitor screens and can reduce the effects of glare.

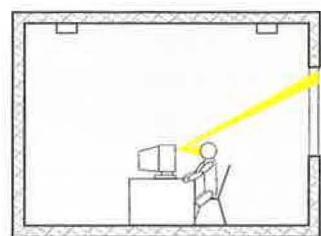
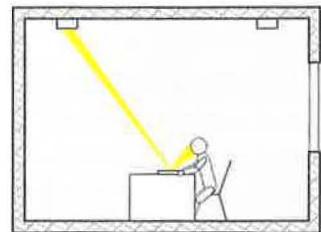


Figure 1 Rule of thumb – imagine that surfaces on and around a task are mirror-like; if the person at work would see a light source reflected, then, in practice, there may be reflected glare

Good housekeeping tips

- Position furniture and computer monitors to minimise glare.
- Use blinds to screen unwanted glare from external daylight.
- Position computers with the screens at 90° to the windows.
- Angle computer screens so that reflections do not cause discomfort.

LIGHTING

Clean lamps and luminaires regularly and replace them at the manufacturer's recommended intervals.

A dirty diffuser or reflector can cut light output by 20%.

MAINTENANCE

Proper maintenance of luminaires and windows will help to maintain good lighting levels.

Attention should be paid to the following.

- Dirty reflectors, diffusers and lamps. The gradual accumulation of dust and dirt over a period of time can significantly reduce the light output. Establish a regular cleaning programme, taking advantage of summer holidays to minimise disruption.
- Discoloured diffusers. The older type of plastic diffuser becomes discoloured with age and can absorb more than 50% of the light output from the lamp. If this is the case, diffusers should be replaced with those made of a clear prismatic material.
- Fluorescent lamps with heavily blackened ends. These are old lamps that are past their economic life (they carry on using the same amount of electricity, but with reduced light output). They should be replaced.
- Windows should be cleaned on a regular basis, as dirty windows encourage unnecessary use of electric lighting and can also contribute to glare problems. Establish a regular cleaning programme.

ENERGY-EFFICIENT LIGHTING

The information in this section is designed to familiarise those responsible for lighting installations with some of the available energy-efficient options. It could be helpful to seek advice from a specialist. When contemplating changes to lighting systems ensure that the lighting consultant or contractor is familiar with the lighting requirements of the School Premises Regulations^[5].

Although good housekeeping will bring about reduced energy costs, there are also opportunities in the life of a school building when improvements to lighting systems can be introduced, thus securing significantly lower energy consumption levels.

Funding is available through the Energy Saving Trust (EST) and currently under the government's 'New Deal for Schools' (NDS) programme.

Replacing lighting provides an opportunity for considering more efficient lamp types and luminaires. Before purchasing energy efficiency options you may wish to discuss this with your lighting consultant or contractor. It may not be cost-effective to replace lighting that is switched on for only short periods. Although the availability of budget is important, it should be considered along with the likely payback periods.

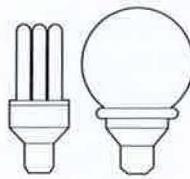
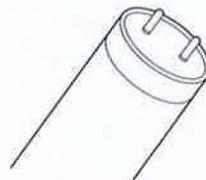
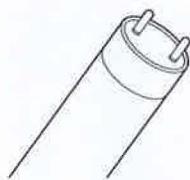
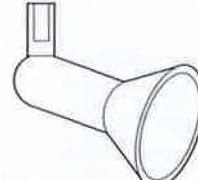
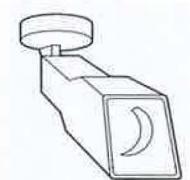
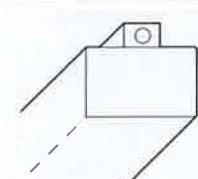
Some of the options are shown in figure 2 opposite. The consultant or lighting contractor will help assess whether or not the proposed investment is cost-effective at this stage. Alternatively, the changes could be introduced during refurbishment.

Where, due to inadequate control, lighting operates when not required, or in areas where there is a significant contribution from daylight, consult a lighting specialist to advise on the most suitable type of controls to meet your needs. Names of lighting specialists in your area are available from one of the organisations listed under 'Professional bodies' on page 18. Modern system controls can reduce energy consumption by typically 20-50%.

Further advice on lighting and lighting controls can be obtained from the EST's 'Lightswitch' Helpline, telephone 0990 133538.

An option to consider when reviewing lighting is zoning, ie connecting luminaires in groups so that lights can be controlled efficiently. The zoning arrangement should allow lights to be switched in rows, parallel to windows, thus allowing lights close to windows to be switched off to take advantage of available daylight.

LIGHTING

Existing lamp type	Energy-efficient option	Energy saving/benefits
	Tungsten light bulbs 	Replace with compact fluorescent lamps (CFLs) in the same fitting* 75% plus longer lamp life
	38 mm (T12) fluorescent tubes in switch-start fittings 	Replace with equivalent 26 mm (T8) fluorescent tubes of lower wattage 8% plus longer lamp life
	High-wattage filament lamps or tungsten halogen lamps as used in floodlights 	Replace with high-pressure sodium or metal halide lighting 65-75% plus longer lamp life
	Mains voltage reflector lamps, filament spot and flood types 	Replace with low-voltage tungsten halogen lighting or metal halide discharge lighting 30-80% for equivalent lighting performance
	Fluorescent fittings with the old 2 ft 40 W, and 8 ft 125 W fluorescent lamps 	Replace with modern, efficient fittings using reflectors/louvres or efficient prismatic controllers with high-frequency electronic or low-loss control gear and triphosphor lamps 30-45% with much improved lighting quality. The use of high-frequency electronic control gear eliminates flicker, hum and stroboscopic effect
	Fluorescent fittings with opal diffusers or prismatic controllers which are permanently discoloured 	Replace with new prismatic controllers or replace complete fittings as above No reduction in energy consumption but increases the amount of light by between 30% and 60%

* Take care where tungsten lighting is used as task lighting for machinery in workshops. Replacing them with CFLs can cause a stroboscopic effect, so tungsten can sometimes be the safest option. An alternative is to use a CFL fitting with high-frequency electronic control gear, which eliminates the stroboscopic effect.

Acknowledgments to the Energy Saving Trust (EST) for co-operation in compiling this information.

Figure 2 Replacement energy-efficient lighting options

3 INFORMATION TECHNOLOGY

If your PC must be left on during the day, switch off the monitor.
This saves more than 60% of the energy.

COMPUTERS

Computers are being used increasingly to support the school curriculum and to undertake administrative work by school staff. With increased staff training and confidence in the use of IT the number of computers per school has grown steadily over the past decade.

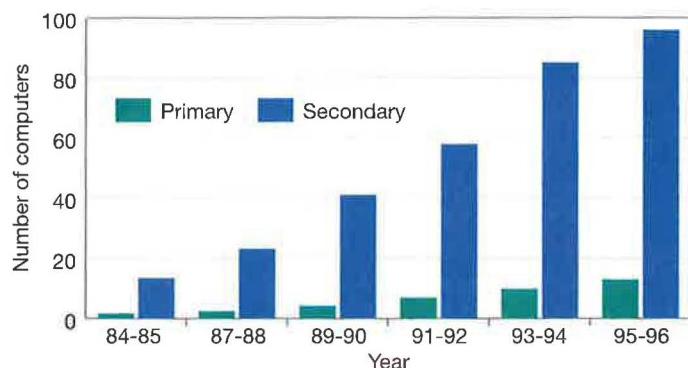


Figure 3 Growth in numbers of computers per school

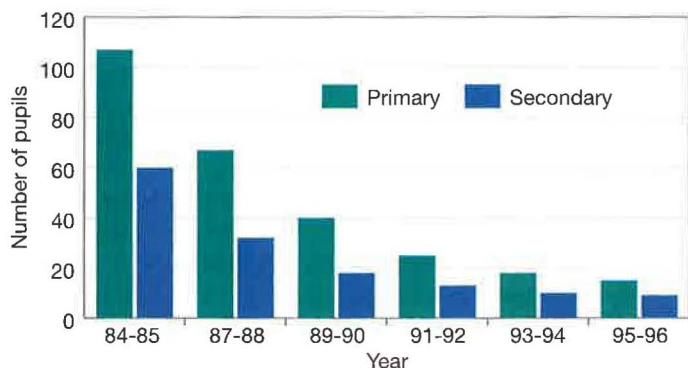


Figure 4 Improving ratio of pupils per computer

Figures 3 and 4 show the growth in numbers of computers per school and the improving ratio of pupils per computer since the mid-1980s^[6].

Energy-saving facilities

The rapid growth of computers in schools is increasing schools' overall energy bills; power consumption through use of computers has almost doubled over the past five years. A typical PC (including monitor) switched on throughout the school day, and turned off at night and at weekends, will use £15 of energy per year. This amount can be reduced by 50% or more by taking advantage of the in-built energy-saving facilities (standby) of most 'modern' PCs, ie 486 DXs and above, built in the last four years. The energy-saving facilities usually allow the user to pre-set 'idle' periods (ie the computer is on but not in use) so that it automatically switches to a low consumption mode. As soon as the user moves the mouse or touches the keyboard the computer display is restored to where the user left off. With such facilities, a school with 50 computers could save over £500 annually.

When setting the energy-saving facilities, be realistic. Do not pre-set software controls so that the computer monitor switches off after just a few minutes, and make sure that the pupils don't tamper with the settings.

However, most importantly, the software-controlled energy management features require activating, and investigations have shown that, typically, only 15% of PCs have power-saving modes activated.

Table 1 indicates the average power consumption levels for PCs and monitors found in schools, together with the typical energy-saving benefits of utilising the computer's energy management facilities, ie standby. These typically average figures take account of the different makes and

Type of equipment	Average power consumption while in use (watts)	Standby energy consumption (watts)
Personal computers and monitors	120	30-45
Personal computers (base only)	40	20-30
Monitors	80	10-15

Table 1 Examples of average power consumption and energy-saving levels that can be achieved

INFORMATION TECHNOLOGY

wide range and configuration of computers and monitors, including those that have sound cards and speakers, modems and CD-ROMs, etc.

The monitor consumes two-thirds of the energy used by a typical PC, and this can be considerably reduced by switching off the monitor when not required, or by using monitors that automatically go into low power consumption mode after a pre-set period of inactivity. Switching off the monitor will not affect data files or unsaved work, although it is a sensible precaution to save work regularly.

Most computers include screen savers. Although primarily intended to prolong screen life, screen savers can be used as an interim energy efficiency measure, where a PC has no other in-built energy saving features. Screen savers can achieve power reductions of 10-20%, provided that they close down to a mainly black screen and recovery is almost immediate. Beware of 'fancy' screen savers that increase consumption – so look out for pupils loading screen savers that do not comply with these requirements! Remember that screen savers should never be used as a substitute for switching off monitors.

Good housekeeping

Although the school is likely to have a mix of computers within the classroom or the school office, with many not having standby facilities. However, there are still some good housekeeping practices that can be followed. Where these are coupled with the tips given for modern PCs, energy costs are effectively minimised by having PCs switched on only when they are required for use.

If the school has the money and opportunity to replace its existing computers, particularly where they are older machines and of varying specifications, it is worth considering a networking configuration using a central server. With this

arrangement, instead of individual PCs running the applications software, the central server is accessed by 'dumb' terminals.

There will be little difference between the electrical consumption levels of the monitors. However, the terminals may consume less power than individual PCs, but the central processor is likely to consume more power than a stand alone PC.

If the school wishes to pursue a networking configuration it is worth consulting the IT department of the local education authority. They are likely to offer free useful advice and guidance.

Switch off PCs.

A typical PC left on all the time would result in CO₂ emissions of 0.8 tonnes annually.

Good housekeeping tips

FOR PERSONAL COMPUTERS

- *Switch off monitors during break times or when the PC is not required for a particular lesson. This saves two-thirds of the energy used by the PC and monitor.*
- *Leave the monitors switched off if PCs need to be switched on all day but are not in constant use throughout the school day.*
- *Ensure that any energy-saving features are set up and activated.*

When replacing computers it is worth ensuring that the new PCs are the most energy efficient. They are unlikely to cost more than less efficient alternatives. Many new computers will include multimedia facilities such as sound cards, microphones, video cameras and modems that may be unnecessary for the curriculum and will increase energy consumption – although the capital cost may be little different.

When purchasing PCs, remember:

- *don't buy multimedia systems unless they are required – they may cost more to run*
- *don't buy monitors with larger screens than are necessary – they only waste energy*
- *look for the Energy Star rating.*

INFORMATION TECHNOLOGY

PRINTERS

There are generally far fewer printers than computers within a school, although, like modern PCs, these often have in-built energy-saving features.

Table 2 below shows the average power consumption of various types of printer, and the lower levels of standby energy consumption obtainable by ensuring that the energy-saving features are activated. The consumption levels take account of the broad range of printers currently in use within schools.

Where large-volume printing is required, it is likely to prove more energy efficient to use laser printers

rather than inkjet printers, due to the faster printing rate of laser printers.

Whether using new or older printers, significant energy savings are still possible. For example, a laser printer operating throughout the school day without a standby facility will use £12 of electrical energy per year. If not switched off at night, at weekends or during the holidays, the annual costs will increase to nearly £60 per year.

Good housekeeping tips

FOR MODERN PRINTERS

- Use any user-controlled energy-saving features.
- Switch off printers at the end of lessons and over the weekends.
- Use low melting point toner where available.
- Don't routinely switch on printers at the start of each day. Wait until they are required for use for the first time each day.
- Switch off at the end of each lesson.
- Use economy or draft mode where provided and when convenient.

When purchasing or replacing printers consider the energy-efficient options.

- Share printers among (networked) staff and pupils.
- Look for the Energy Star rating.

Type of printer	Average power consumption while in use (watts)	Standby energy consumption obtainable (watts)
Dot matrix	30-70	20-30
Inkjet	40-80	20-30
Laser	90-130	20-30

Table 2 Average power consumption and energy-saving levels that can be achieved

INFORMATION TECHNOLOGY

REPROGRAPHIC EQUIPMENT

Photocopiers and copy printers are used frequently in schools. Although copy printers are more economical than photocopiers, they are practical only for large production runs.

Some schools have several photocopiers that are switched on all day, regardless of how frequently they are used. It may be worth considering switching off the larger machines for part of the time, using the smaller machine for light print runs which are more frequent and switching on the larger machines for only the occasional heavy print run. This will require consultation with school staff to determine the practicality of such

an arrangement. Table 3 shows the average power consumption of a range of equipment used by a school's reprographic department.

Type of equipment	Average power consumption in use (watts)	Average energy consumption in idle/standby mode (watts)
Fax machine	30-40	10
Photocopiers	120-1000	30-250
Copy printer	160-280	35-50

Table 3 Average power consumption and energy-saving levels that can be achieved

A photocopier left switched on overnight uses enough energy to make 5300 photocopies.

Good housekeeping tips

PHOTOCOPIERS

- Make sure that copiers are switched off out of school office hours.
- Use energy-saving features, such as standby, if they are installed.
- Use low melting point toner where practical.
- Issue magnetic access cards to teachers and other members of staff to regulate and discourage unnecessary usage.

4 OTHER CURRICULUM-BASED ELECTRICAL EQUIPMENT

Modern electronic equipment requires short warm-up times

**SO SWITCH IT
ON ONLY WHEN REQUIRED FOR USE.**

Most equipment used within the school curriculum consumes small amounts of electricity. However, when added together the overall consumption levels can be considerable. The most practical way to achieve energy savings is to use equipment that is efficient, and to use it only when necessary. There is always potential for improvement in terms of usage. Some equipment, such as tape players and musical keyboards, consume energy when switched on, even if not actually operating.

Some low-voltage operated equipment has a separate mains converter, so even when the equipment is turned off the power supply unit will still consume some power. Where this is the case, the power unit should be switched off at the mains socket.

Most electrical equipment requires no warm-up time, so don't switch on until required for use.

Good housekeeping tips

Some of these good housekeeping tips also make sense from a safety point of view.

- Decide at the outset of a lesson which equipment is required to be used.
- Switch on equipment when required for use.
- Where equipment is used for measurements, allow sufficient warm-up time so that accuracy is unaffected, ie through 'drift'.
- Fully load kilns before firing.
- Clean the kiln in accordance with the manufacturer's instructions.
- Soldering irons heat up fairly quickly, so unplug them when not required.
- Make sure that other workshop and laboratory equipment is turned off when not required.

AUDIO-VISUAL EQUIPMENT

Most schools use audio-visual equipment for educational purposes. This includes the use of television and video to show educational programmes, the use of CD and audio tape players, electronic music equipment and overhead projectors (OHPs).

The annual electrical running costs for a television set can be £32, when left switched on throughout the school year. When added together with the maximum potential running costs for all other audio-visual equipment, the cost could well run into many hundreds of pounds per year. Switching off is the answer, although the use of standby modes will reduce overall power consumption.

Good housekeeping

For most audio-visual equipment, standby modes should not be used as an alternative to switching off. Although power consumption in standby mode may appear small and the cost to the individual school not necessarily considered significant, the UK's total energy costs for all equipment left in the standby mode is high. For example, it is estimated that if all the UK's next generation of domestic digital TV receivers were left on standby, the total power consumption would be the entire output of a 500 megawatt power station^[7]. Some TV manufacturers are already developing receivers that will consume less than one-tenth of a watt when in standby mode with a view to reducing the potential impact.

For the school to make its contribution to minimising its standby energy costs, the following measures can be taken.

- Turn off equipment rather than use the standby facility, except where equipment, such as videos, may lose programme settings if disconnected from the mains.
- OHPs often have a switch for reducing lamp brightness. Use the facility where the luminance is sufficient for the class.

OTHER CURRICULUM-BASED ELECTRICAL EQUIPMENT

SCIENCE, TECHNOLOGY AND CRAFT

There is likely to be a range of electrical equipment within a school's science laboratory. Although most of the equipment consumes little power when in use, eg oscilloscopes, there is a danger that the equipment could be left switched on all day.

Laboratory equipment such as soldering irons have relatively small power consumption, but when multiplied by a typical class of around 20 pupils the energy consumption becomes significant.

Typically, such equipment is supplied and switched on by a laboratory technician at the beginning of the class and left on until the class ends.

FOOD TECHNOLOGY

The main consumers of energy in Food Technology are cookers (oven and hob) and refrigerators.

Cookers consume relatively large amounts of power, and are typically used for more than 10 hours per week in a large secondary school.

The power consumption of domestic cookers can be up to 8 kW. There is a range of hobs (halogen) that heat up and cool down very quickly. When purchasing new hobs, consider this option.

The energy consumption and annual running costs of refrigerators and freezers are shown in table 4. Because of the wide range of sizes available and the variation in performance between different models, manufacturers of refrigerators and freezers now display efficiency ratings for each new model. These indicate how well the appliance performs in terms of energy consumption. An 'A' rating is the best and a 'G' rating is the worst. The energy consumption figures for refrigerators and

freezers are shown as kilowatt-hours (kWh) per year. The kWh/year is a more realistic way of showing energy consumption of equipment that is permanently switched on. Refrigerators and freezers switch on and off at a ratio of approximately 1:2, consuming around only 100 watts when switched on. The annual running costs depend on the duty cycle, which, in turn, is a reflection of the efficiency of the appliance, and how it is used.

Most cooking equipment takes only ten minutes to warm up – don't turn on too soon.

Leaving hobs and ovens on wastes energy, makes the kitchen too hot for comfort and can be a safety hazard.

Good housekeeping tips

- Use the right size saucepans for your cooking needs.
- Control grills to avoid wasting heat.
- Switch off ovens immediately after use.
- Consider halogen hobs when purchasing new equipment.
- Kettles – don't heat more water than is needed.
- Microwave ovens – cheaper to run than conventional cookers.
- Refrigerators – don't position them near heat sources, eg cookers:
 - don't underfill or overfill (follow the manufacturer's instruction)
 - set the thermostat control at a sensible setting for the contents (see user's handbook)
 - do not open door unnecessarily
 - check door seals.
- Freezers – these operate more efficiently when full:
 - set the thermostat control in accordance with the user's handbook
 - don't leave freezer doors open
 - check door seals.

Type	Efficiency rating	Storage capacity (litres)	Annual consumption (kWh)	Annual cost (£)
Refrigerators	B	153	164	11.50
	E	150	299	21
Freezers	A	97	208	14.50
	G	84	544	38

Note: Costs based on 7p/kWh for electricity

Table 4 Examples of differences in the annual energy consumption of refrigerators and freezers

5 GOOD HOUSEKEEPING CHECKLIST

The following checklist can be used to form part of a regular monthly check on electrical energy housekeeping in a school, and could be followed up with a report on its results to staff and pupils and school governors.

Checked by

Date

Yes No Action/person responsible

ENERGY AWARENESS

Energy awareness campaign announced

Role of governors, teachers, premises manager and pupils discussed and agreed

Energy efficiency incorporated within school curriculum

System for monitoring effectiveness of campaign agreed

Implement campaign

Publicise results

LIGHTING

Use daylight when levels are satisfactory

Check that controls are set properly

Consider zoning of lighting

Use pupils as energy monitors to switch off lights at the end of classes, at break times and at the end of the day

Nominate individuals to switch off lights in areas that are not in use

Label all light switches to indicate which lights they control

Minimise glare by reviewing the brightness of light sources and the position of PC monitors

Use blinds on windows to eliminate glare

Consider fitting anti-glare filters to computer monitor screens

When replacing old lamps use more energy-efficient types

Agree a maintenance schedule for replacing and cleaning lamps

Agree a schedule for cleaning windows

INFORMATION TECHNOLOGY

Computers

Don't switch on computers and monitors until required for use

Use screen savers that close down to a mainly black screen

Set up and activate standby modes for monitors and PCs

Make pupils responsible for switching off PCs at the end of lessons

Avoid leaving computers switched on overnight

If computers must stay on, switch off monitors

Consider networking using a central server

Use 'Energy Star' rated equipment where available

GOOD HOUSEKEEPING CHECKLIST

	Yes	No	Action/person responsible
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Printers

- Use low melting point toner
- Don't switch on until required for use
- Use energy-saving features
- Switch off at the end of each lesson
- Use economy or draft mode

Reproductive equipment

- Switch off equipment out of school hours
- Use energy-saving features
- Use low melting point toner where practical
- Consider magnetic access cards to regulate and discourage unnecessary use
- Check that equipment is maintained properly

OTHER CURRICULUM-BASED EQUIPMENT**Audio-visual equipment**

- Don't switch on until required
- Switch off rather than use standby facilities
(unless settings will be lost, such as video recorders)
- Switch off musical equipment that consumes electricity even when not being played
- Switch off power supply units, not just the keyboards
- Switch OHPs to low lamp brightness where luminance is sufficient for class

Science, Technology and Craft

- Switch off any equipment that is not required
- Fully load kilns before firing
- Clean kilns in accordance with manufacturer's instructions
- Unplug soldering irons when not required

Food Technology

- Do not use cookers to heat the room
- Use the right size saucepans for your cooking needs
- Control grills to avoid wasting heat
- Switch off ovens immediately after use
- Consider halogen hobs when replacing equipment
- Use microwave ovens to reheat small quantities of food
- Don't fill kettles with more water than is required to be boiled

Refrigerators and freezers

- Don't position near heat sources
- Set thermostats at a sensible setting (see user's handbook)
- Do not open door unnecessarily
- Check that door seals are in good condition

REFERENCES AND FURTHER READING

REFERENCES

- [1] **Department of the Environment, Transport and the Regions.** Energy Consumption Guide 73, 'Saving energy in schools – a guide for headteachers, governors, premises managers and school energy managers'. DETR, London, 1998
- [2] **Department of the Environment, Transport and the Regions.** Good Practice Guide 222, 'Reducing catering costs through energy efficiency – a guide for kitchen designers, contract caterers and operators'. DETR, London, 1998
- [3] **Department of the Environment, Transport and the Regions.** Good Practice Guide 145, 'Maintaining the efficient operation of heating and hot water systems in schools'. DETR, London, 1995
- [4] **Department of the Environment, Transport and the Regions.** Good Practice Guide 172 'Marketing energy efficiency – raising staff awareness', DETR, London, 1997; and the 'Running an awareness campaign' pack, DETR, London, 1997
- [5] **Department for Education and Employment.** Building Bulletin 87 (BB87) 'Guidelines to environmental design in schools' (Revision of Design Note 17). DfEE, London, 1997
- [6] **Department for Education and Employment.** 'Survey of information technology in schools 1996'. DfEE, London, 1996
- [7] New Scientist, 'This Week', 14 February 1998

FURTHER READING

Department for Education and Employment

Building Bulletin 90 (BB90) 'Lighting design for schools' (to be published 1999) ISBN 011 27 10 417

FURTHER ASSISTANCE

All of these organisations are working together to promote and support energy efficiency in schools.

BRECSU

BRECSU, on behalf of the DETR, provides a series of Guides and Case Studies on schools' energy management, including a free information pack and audiotape.

BRECSU, Garston, Watford WD2 7JR
Tel 01923 664258

CREATE (The Centre for Research, Education and Training in Energy)

CREATE is the national co-ordinating body for energy education. It sells guidebooks, equipment and software, publishes a free teachers' newsletter (Energy Watch), and provides a free enquiry service for pupils, teachers and managers.

CREATE, Kenley House, 25 Bridgeman Terrace
Wigan WN1 1TD. Tel 01942 322271

ENERGY SAVING TRUST

The Energy Saving Trust (EST) is a non-profit distributing company set up by the Government and major energy companies. Its objective is to promote the efficient use of all forms of energy in the UK by domestic companies and small businesses, leading to an overall reduction in environmental emissions, including the greenhouse gas, carbon dioxide.

The Trust is currently running a 'Schools Cashback' scheme, which invites schools to apply for a rebate on installed energy efficiency measures. Details are available on the Trust's behalf from CREATE (see above).

In addition, advice on lighting and lighting controls is available from the EST's Lightswitch Helpline (tel 0990 133538). Lightswitch also operates a lighting controls cashback scheme.

Energy Saving Trust, 21 Dartmouth Street
London SW1H 9BP
Tel 0171 222 0101

CSE (The Centre for Sustainable Energy)

CSE promotes energy efficiency and sustainable energy planning by working with schools, carrying out research work and by providing a wide range of publications, advice and training facilities.

CSE, B-Bond Warehouse, Smeaton Road
Bristol, BS1 6XN
Tel 0117 929 9950

Eco-Schools

Eco-Schools is a European initiative to help schools become environmentally friendly in both the curriculum and the management of the school. The prestigious Eco-Schools flag is awarded to schools, that fulfil the criteria. In the UK Eco-Schools is

REFERENCES AND FURTHER READING

promoted and sponsored by Going for Green and managed by the Tidy Britain Group.
Eco-Schools Manager, Tidy Britain Group
The Pier, Wigan WN3 4EX
Tel 01942 824620

Groundwork

Esso Young Energy Savers is one of Groundwork's 30 national regeneration and education programmes. Specifically trained Groundwork personnel assist groups of primary schools to enhance their teaching of energy awareness and to use pupil's knowledge to improve energy management at school and in the home.
Groundwork National Office
85-87 Cornwall Street, Birmingham B3 3BY
Tel 0121 236 8565

PROFESSIONAL BODIES

The following organisations can provide details of lighting contractors.

CIBSE Lighting Division

Tel 0181 675 5211

Institute of Lighting Engineers

Tel 01788 576492

International Association of Lighting

Designers

Tel (enquiries only) 01788 576492

WEBSITES

School Energy Website

<http://www.schoolenergy.org.uk>

CREATE

<http://www.create.org.uk/>

DETR ENERGY EFFICIENCY BEST PRACTICE PROGRAMME DOCUMENTS

The following Best Practice programme publications are available from BRECSU Enquiries Bureau. Contact details are given on the back page.

Introduction to Energy Efficiency

- 1 Introduction to energy efficiency – Building Energy Efficiency in Schools. A guide to a Whole School Approach

General Information Leaflet

- 7 Energy Efficiency in Schools and Colleges: Experience in 20 Case Studies

Good Practice Case Studies

- 38 Energy efficiency in schools. Condensing gas boilers. Condensing gas boilers for heating and hot water in schools
- 73 Energy efficiency in schools: potential benefits of boiler replacement
- 94 Energy efficiency in schools. Building Energy Management Systems
- 95 Energy efficiency in schools – local controls for heating and lighting
- 99 Energy Saving in Schools. Energy Management by a School Governor
- 100 A teacher as the focus for energy efficiency
- 101 Energy efficiency in schools – some simple energy conservation measures
- 184 Energy efficiency in schools – a Head Teacher speaks out
- 185 'Out-of-hours' use of schools

Good Practice Guides

- 29 Good housekeeping in schools. A guide for school staff, governors and pupils
- 57 Conducting an energy walk-round. A guide for school energy managers, headteachers and governors
- 118 Managing energy use. Minimising running costs of office equipment and related air-conditioning
- 136 Is your energy use under control? – A practical guide to assessment and action
- 186 Developing an effective energy policy
- 199 Energy efficient lighting – a guide for installers
- 233 Energy efficient refurbishment of schools

THERMIE Maxibrochure

Energy efficient lighting in schools

The Department of the Environment, Transport and the Regions' Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

For further information on:

Buildings-related projects contact:

Enquiries Bureau

BRECSU

BRE

Garston, Watford, WD2 7JR

Tel 01923 664258

Fax 01923 664787

E-mail brecsu@bre.co.uk

Internet **BRECSU** - <http://www.bre.co.uk/brecsu/>

Internet **ETSU** - <http://www.etsu.com/eebpp/home.htm>

Industrial projects contact:

Energy Efficiency Enquiries Bureau

ETSU

Harwell, Oxfordshire

OX11 0RA

Tel 01235 436747

Fax 01235 433066

E-mail etsuenq@aeat.co.uk

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting etc.